33. Traffic, transport and access

33.1. Introduction

An assessment of potential traffic and transport impacts of the indicative long term development of the proposed proposed airporthas been undertaken.

This chapter builds upon the consideration of potential traffic and transport impacts associated with the Stage 1 development presented in Chapter 15 of Volume 2. It is based upon a comprehensive Surface Transport and Access Study provided in Appendix I in Volume 4.

33.2. Methodology

The methodology used for assessment of the long term development was consistent with that used for the Stage 1 development. Two modelling 'scenarios' were developed for the purpose of this assessment.

- 'Do Minimum' represents the minimum transport network improvements required to maintain the status quo, without consideration of the expected additional demand generated by the proposed airport.
- 'With Airport' includes consideration of the expected additional demand generated by the proposed airport.

The NSW Bureau of Transport Statistics Strategic Travel Model (Version 3) was used and the assessment was undertaken in four main stages:

1. trip generation, or travel frequency (how many trips would occur to and from a nominated travel zone with regard to the demographics and land uses of that zone);
2. trip distribution (where these trips are likely to go);
3. travel mode choice (car, bus, rail, ferry or a combination); and
4. assignment (route chosen for each trip, for each mode, between each origin-destination pair). This stage provides the detail for the number of vehicles on each road and people on each public transport service

Assessment of the long term concept for the proposed airport is based on the year 2063, when forecast passenger movements are expected to be approximately 82 million annual passengers, with demand serviced by approximately 59,500 employees.

The assumed road network for the 2063 assessment year is generally consistent with the 2031 model used to assess the Stage 1 development, with the addition of the proposed Castlereagh Highway between Bells Line of Road at Kurrajong, and the north-western section of the M7 Motorway near Dean Park.

With the exception of a rail connection to the proposed airport (through a possible extension of the South West Rail Link to the airport site and on to St Marys), the assumed public transport network is also similar to that modelled as part of the assessment of Stage 1.

It should be noted that the NSW and Australian governments have not commenced planning any road or transport upgrades beyond 2041. As information about the transport network beyond 2041 is not available, the 2063 airport demand forecasts have been assigned to a 2041 transport network.

33.2.1. Assessment criteria

Assessment of the potential traffic, transport and access impacts has been undertaken with reference to the *Guide to Traffic Generating Developments* (RTA 2002). This guideline suggests a process and methodology to undertake the assessment which would be familiar to NSW stakeholders and the community. The operational traffic assessment process outlined in the guidelines stipulates that the operating characteristics need to be compared with agreed performance criteria.

33.2.1.1. Midblock capacity

The capacity of urban roads is generally determined by the capacity of the intersections or the 'midblock' capacity (the sections of roads between intersections). The mid-block capacities for roads can be estimated and compared to the existing traffic volumes in terms of volume to capacity ratios (VCR).

The VCR is a measure of the amount of traffic carried by a section of road compared to its nominal capacity. As volume/capacity nears one, the speed on the link decreases and both the likelihood and the duration of flow breakdowns increase.

The Austroads *Guide to Traffic Management*[1] outlines Level of Service (LoS) criteria for mid-block sections of road based on the VCR. A summary of these Levels of Service is presented in Table 33–1.

[1] *Part 3: Traffic Studies and Analysis (2009)*

Table 33–1 – Level of Service descriptions for roads

Level of Service (LoS)	Uninterrupted flow facilities (Motorways)	Uninterrupted flow facilities (Arterial and collector roads)	Volume/capacity ratio
A	Free flow conditions in which individual drivers are unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.	Primarily free flow operations at average travel speeds, usually about 90% of the free flow speed (FFS) for the given street class. Vehicles are completely unimpeded in their ability to manoeuvre within the traffic stream. Control delay at signalised intersections is minimal.	0.00 to 0.34
B	Zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is less than with LoS A.	Reasonably unimpeded operations at average travel speeds, usually about 70% of the FFS for the street class. The ability to manoeuvre within the traffic stream is only slightly restricted and control delays at signalised intersections are not significant.	0.35 to 0.50
C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	Stable operations; however ability to manoeuvre and change lanes in mid-block locations may be more restricted than at LoS B, and longer queues, adverse signal coordination or both may contribute to lower average travel speeds of about 50% of the FFS for the street class.	0.51 to 0.74
D	Close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.	A range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LoS D may be due to adverse signal progression, inappropriate signal timing, high volumes or a combination of these factors. Average travel speeds are about 40% of FFS.	0.75 to 0.89
E	Occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause breakdown.	Characterised by significant delays and average travel speeds of 33% of the FFS or less. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections and inappropriate signal timing.	0.90 to 0.99
F	In the zone of forced flow. With LoS F, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs and queuing and delays result.	Characterised by urban street flow at extremely low speeds, typically 25% to 33% of the FFS. Intersection congestion is likely at critical signalised locations, with high delays, high volumes and extensive queuing.	1.0 or greater

Source: Adapted from Austroads Guide to Traffic Management – Part 3: Traffic Studies and Analysis.

33.3. Assessment of impacts during operation

To assess the potential transport network impacts of the indicative long term airport development, consideration was given to the travel demand that would be created by passengers, employees and freight. The expected trip generation for each of these groups is considered in Sections 33.3.1, 33.3.2 and 33.3.3 respectively. The overall expected impacts on network performance are discussed in Section 33.3.6.

The assessment has not considered traffic associated with future commercial development. While the proposed airport includes authorisation for future non-aeronautical commercial development, the details of such development would be developed by the ALC and would be subject to authorisation under the Airports Act.

33.3.1. Passenger trips

In 2063, it is estimated that the proposed airport would be operating to support an anticipated demand of 82 million annual passengers. As explained in Chapter 15 of Volume 2, to understand the transport impact these passenger movements may have, they need to first be translated into trips and then assigned to the surrounding road network using the Strategic Transport Model. The process of determining passenger trips from flight movements, passenger movements and an assignment to different transport modes is discussed below.

Flight movements

A passenger flight profile for the indicative long term development was developed based on the number of daily and peak hour passenger flights. The profile for 2063 is shown in Figure 33-1.

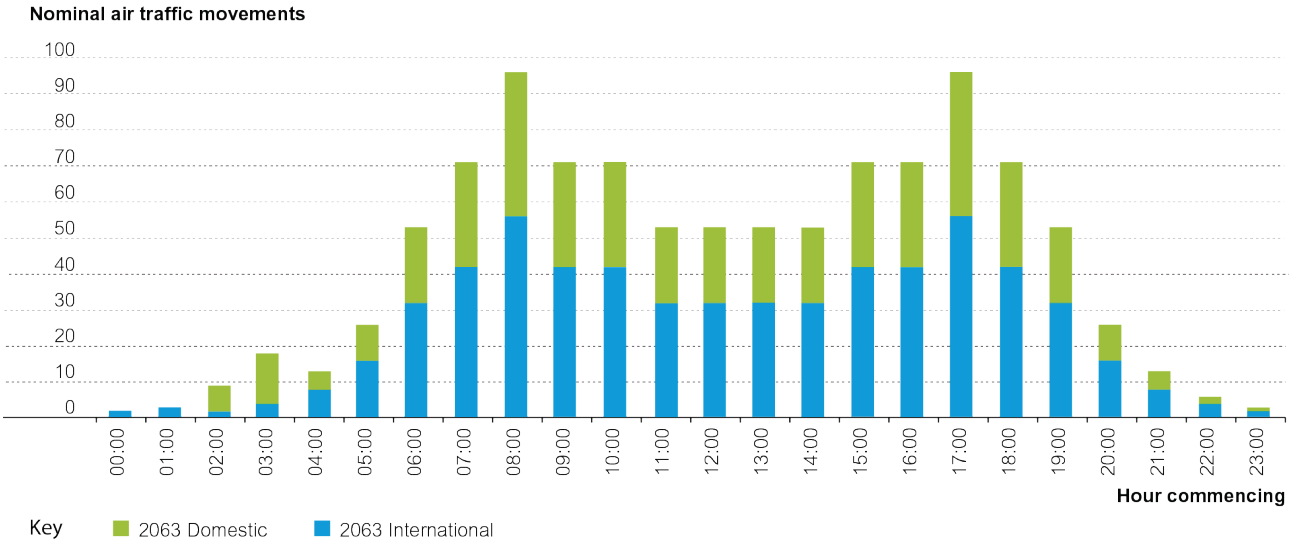


Figure 33-1 – Hourly flight arrivals / departures – 2063

In 2063, there are expected to be a total of 1,001 passenger flights per day of which 604 are expected to be domestic and 397 are expected to be international. During the peak hour, there are expected to be 94 passenger flights of which 46 are expected to be arrivals (domestic and international) and 48 are expected to be departures (domestic and international).

33.3.1.1. Passenger movements

For each domestic and international flight in 2063, a profile of the passengers expected to be entering and exiting the proposed airport was determined to generate a ground transport demand profile. The profile is shown in Figure 33-2.

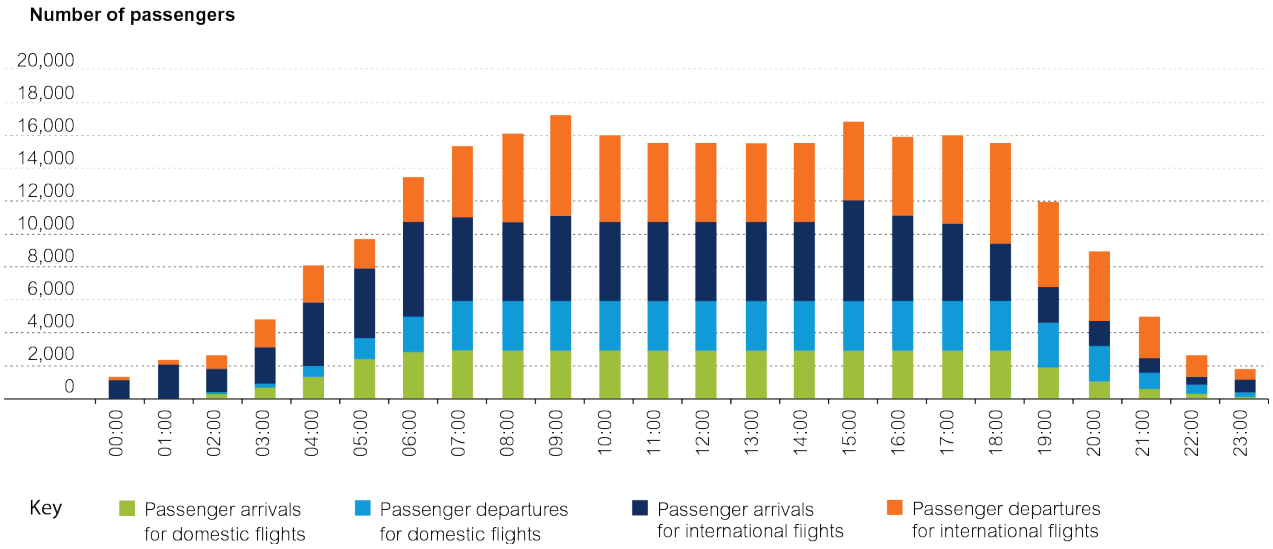


Figure 33-2 – 2063 ground transport demand per hour

33.3.1.2. Transport mode split

The Sydney Airport Land Transport Model and its assumed mode split were used to assign the calculated ground transport demand to the modes listed in Table 33–2.

Table 33–2 – 2063 assumed mode split

Mode	2063 assumed mode split			
	Domestic		International	
	Drop-off	Pick-up	Drop-off	Pick-up
Kiss ‘n’ fly	22%	22%	26%	26%
Park ‘n’ fly	20%	20%	18%	18%
Taxi	20%	20%	20%	20%
Shuttles	5%	5%	5%	5%
Bus	13%	13%	13%	13%
Train	20%	20%	18%	18%

Suitable dwell times for each transport mode were applied (e.g. longer dwell times were assumed for international kiss ‘n’ fly passengers when compared to their domestic counterparts).

Figure 33-3 shows the number of passenger arrivals via ground transport at the proposed airport that would be expected in 2063. Figure 33-4 shows the total departures that would be expected from the proposed airport via ground transport in 2063.

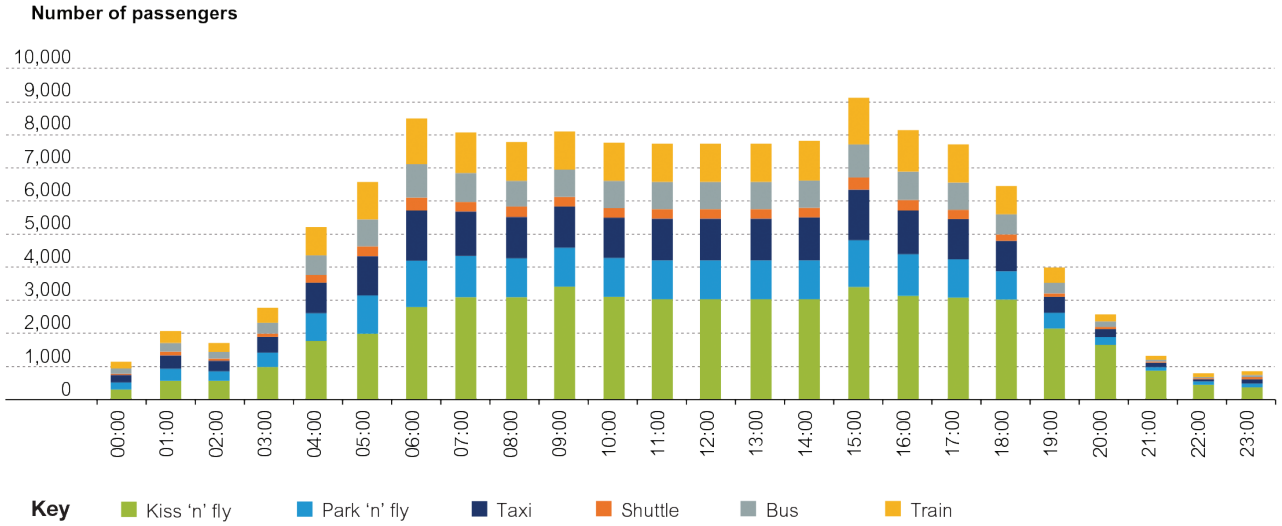


Figure 33-3 – Total passenger arrivals at the airport by ground transport mode

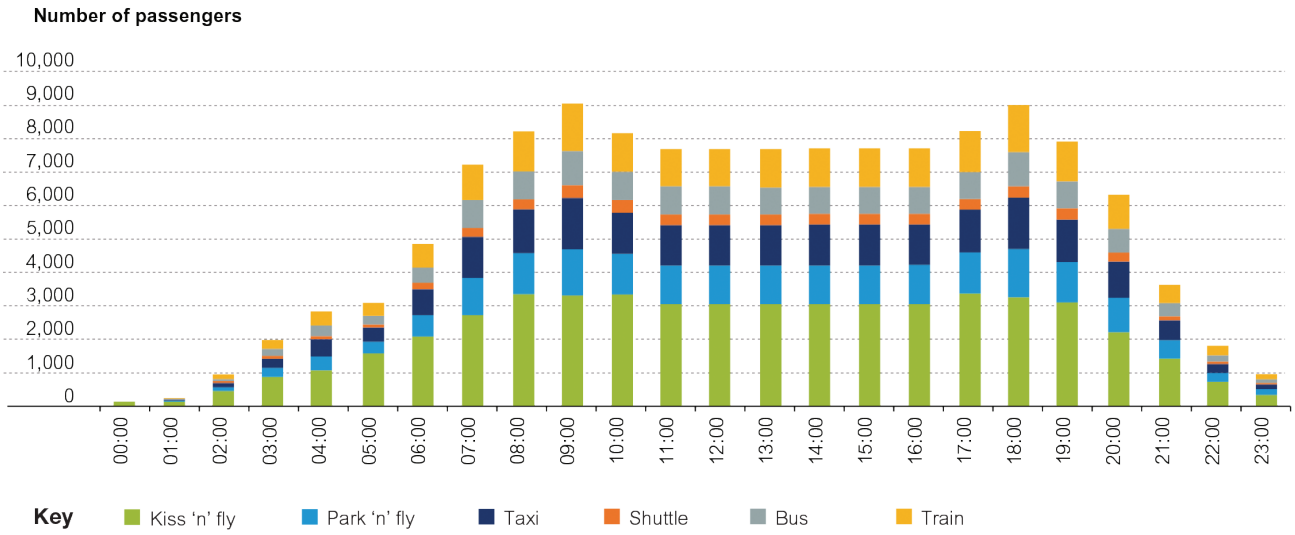


Figure 33-4 – Total passenger departures at the airport by ground transport mode

33.3.1.3. Traffic generation

The trips (by mode) shown in Figure 33-3 and Figure 33-4 were assigned to vehicles entering / exiting the airport site to determine the passenger related traffic generation (excluding vehicles such as taxis circulating internally within the site).

Figure 33-5 shows that in 2063, 4,332 vehicles are expected to enter the airport site during the AM traffic peak and 4,152 vehicles are expected to enter the airport site during the PM traffic peak period. Figure 33-6 shows that in 2063, 4,361 vehicles are expected to leave the proposed airport during the AM traffic peak and 4,492 are expected to leave the proposed airport during the PM traffic peak.

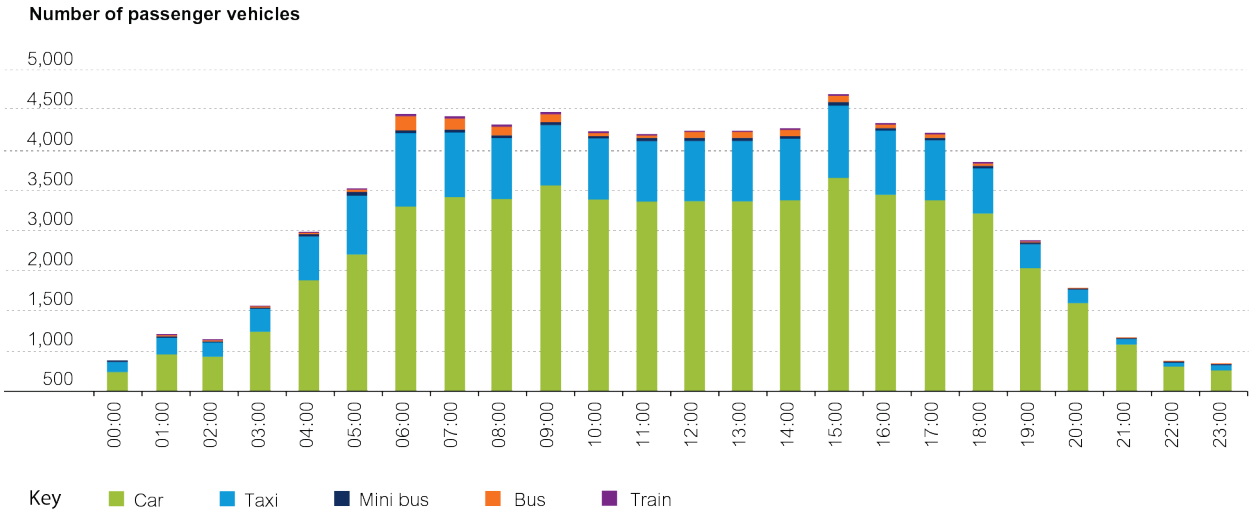


Figure 33-5 – Passenger vehicles entering the airport site (2063)

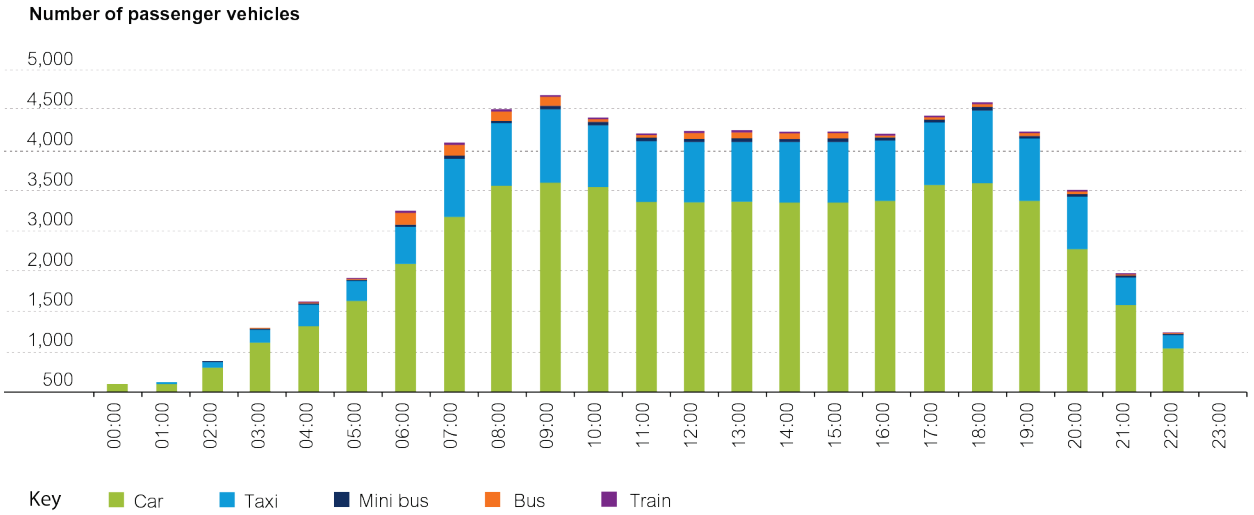


Figure 33-6 – Passenger vehicles leaving the airport site (2063)

33.3.2. Employee trips

33.3.2.1. Employees and shifts

Based on a ratio of 750 workers per one million annual passengers, the number of employees required at the proposed airport in 2063 is estimated to be 59,500. Consistent with the experience of Sydney Airport and other international airports, it was assumed that up to 80 percent of employees (47,392) would be on-site on any given day. Table 33–3 shows how the proposed airport employees were categorised.

Table 33–3 – Proposed 2063 employee shift profiles

Employee type	Start	Finish	% total employees	Employees on site
Airfield overnight	21:00	05:00	2	1,700
Airfield day	05:00	13:00	3	950
Airfield afternoon	13:00	21:00	3	950
Terminal support morning	06:00	13:00	10	4,760
Terminal support afternoon	13:00	20:00	10	5,712
Terminal supplementary morning	06:00	10:00	14	6,664
Terminal supplementary afternoon	15:00	19:00	14	5,712
Office early start	07:00	17:00	21	9,996
Office later start	09:00	19:00	23	10,948
			Total	**47,392**

33.3.2.2. Employee arrival and departure profiles

A profile for employee arrivals and departures prior to and after their shifts was developed and is illustrated by Figure 33-7. The profile acknowledges that some employees will arrive in the hour before their shift starts and/or leave in the hour after their shift finishes.

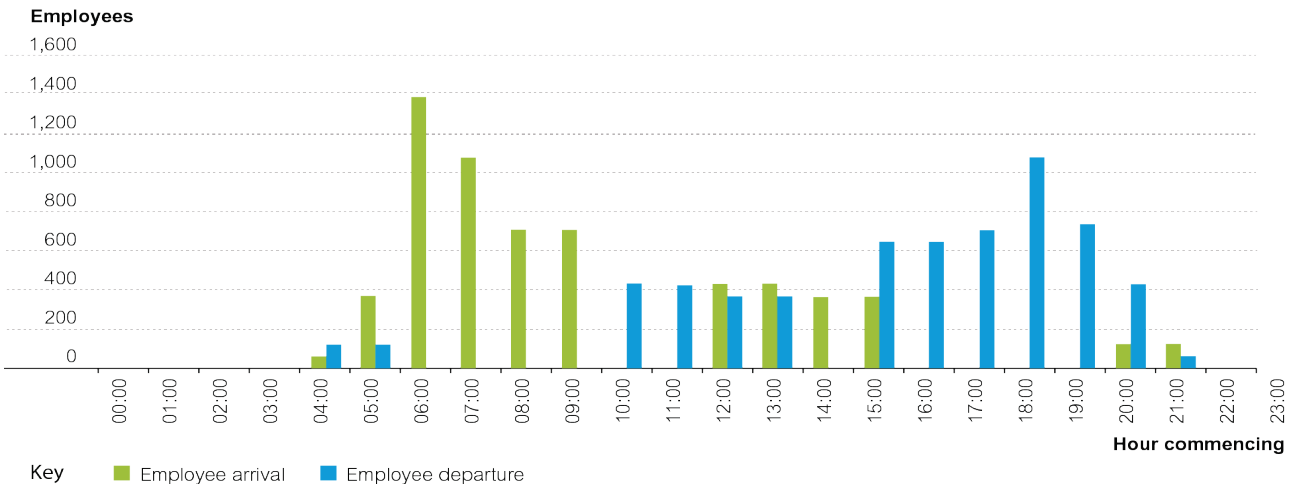


Figure 33-7 – 2063 Employee arrival and departure profile

Figure 33-7 shows that the peak arrival for the AM peak period would be 10,710 employees and the PM peak departure for employees (between 7pm and 8 pm) would be 8,330 employees.

33.3.2.3. Mode split

The employee mode spilt for the indicative long term development was determined by taking the base mode split used for Stage 1 operations and modifying it as follows:

- modifying the split for car modes to reflect the potential capacity of a staff car park; and
- distributing the staff trips to bus and rail modes.

Figure 33-8 and Figure 33-9 show the calculated distribution of arrivals and departures respectively. It can be seen that the AM peak arrival volume for cars would be 3,213, while the PM peak departure volume for cars would be 3,332.

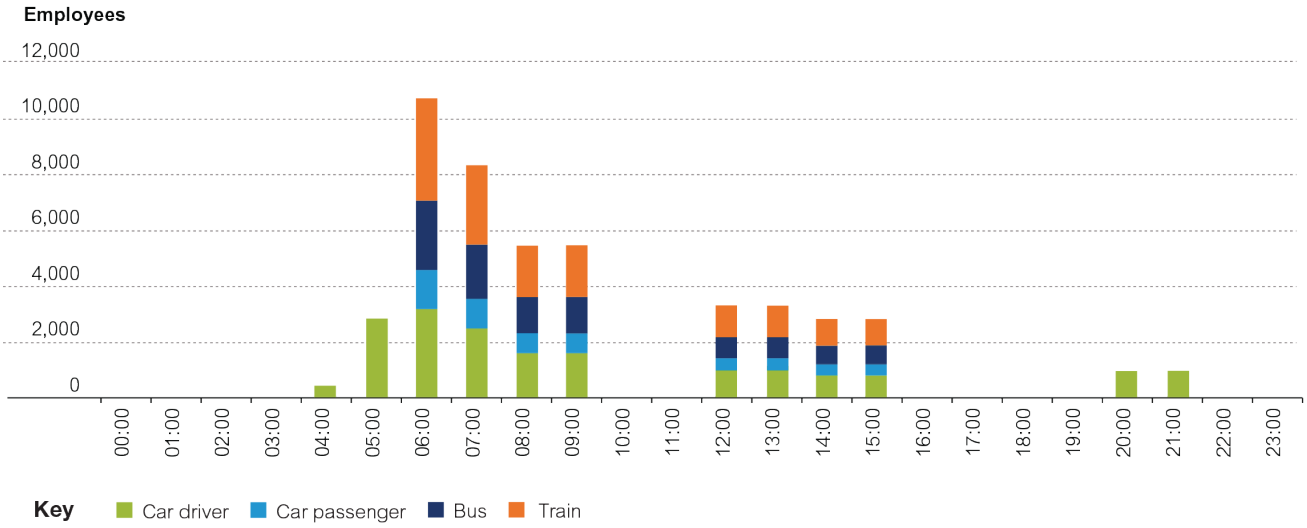


Figure 33-8 – 2063 employee arrivals by mode and time of day

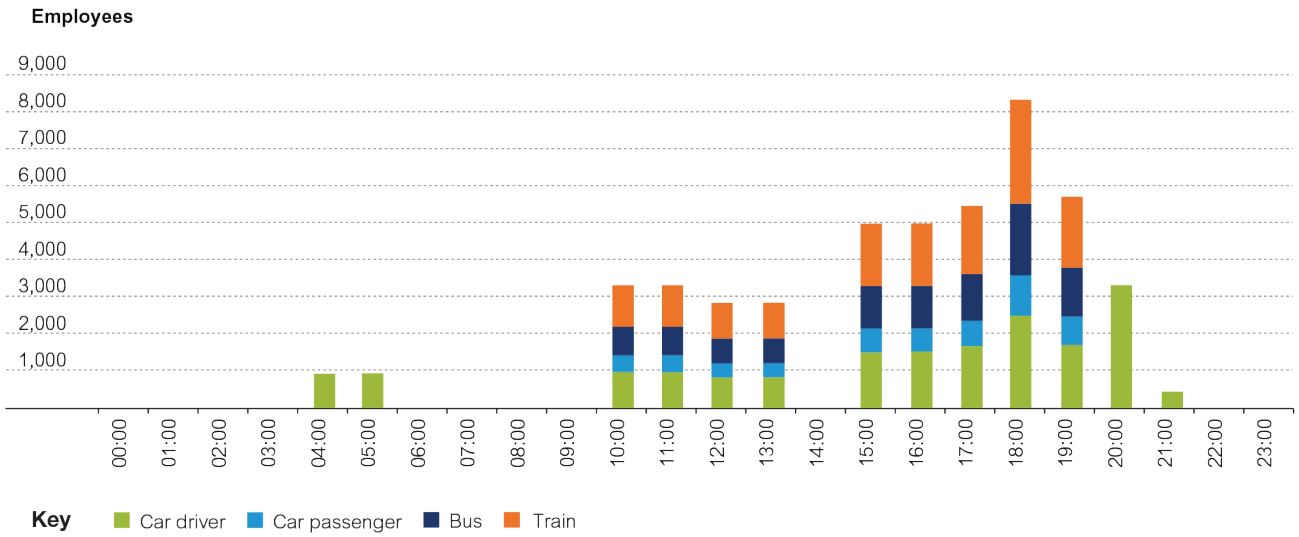


Figure 33-9 – 2063 employee departures by mode and time of day

33.3.2.4. Traffic generation

The calculated employee arrivals and departures were assigned to vehicles to determine the number of vehicles entering and leaving the airport site throughout the 24 hour operational period. The results are shown in Figure 33-10 for arrivals and Figure 33-11 for departures. Employee traffic generation peaks are expected to be outside the main traffic peaks of 7am to 9am, and 4pm to 6pm for the arrival and departure of employees.

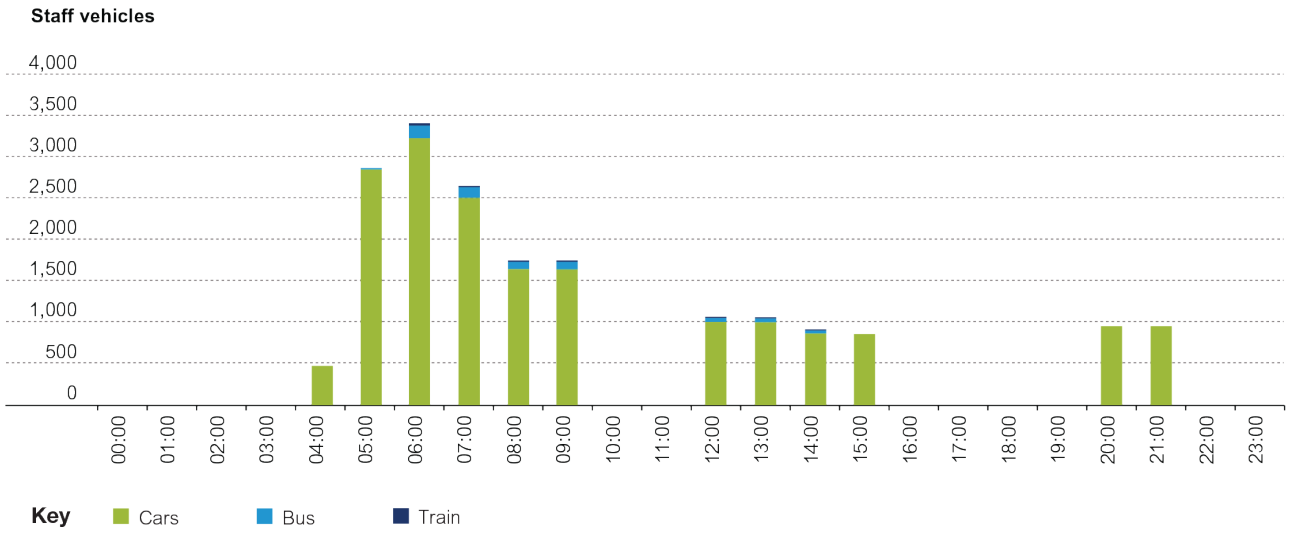


Figure 33-10 – 2063 employee arrivals by mode

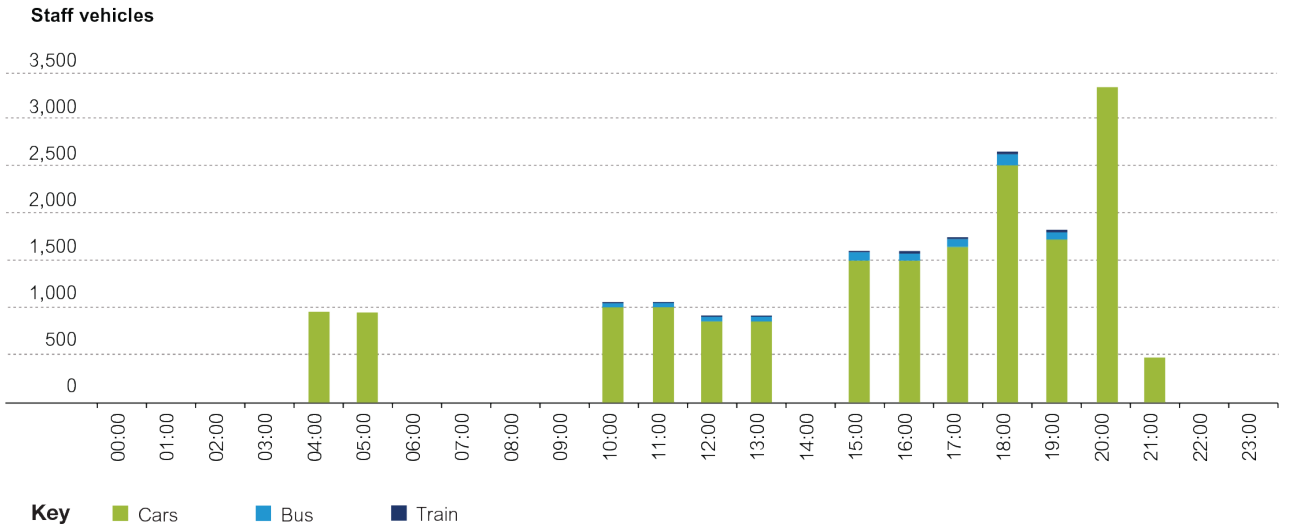


Figure 33-11 – 2063 employee departures by mode

33.3.3. Freight trips

Freight demand has been identified for air freight cargo. Demand estimates for airport consumables (e.g. food, retail items) or waste removal cannot be calculated before a detailed terminal plan is developed and have therefore been excluded from the assessment.

The freight demand for air cargo is estimated to be 1,021,210 tonnes in 2063. It has been assumed that the cargo freight arrives and departs the proposed airport on heavy rigid trucks, semi-trailers and B-doubles. Table 33–4 gives the estimated heavy vehicle volumes (and car equivalents).

Table 33–4 – 2063 two-way truck movements

Vehicle type	2063 Annual movements	2063 Daily movements	2063 Hourly movements	2063 Car equivalents per hour
Heavy Rigid Truck (12.5 metres long)	112,603	308.50	12.85	25.71
Semi-Trailer (19 metres long)	13,534	37.08	1.54	4.63
B-Double (23 -26 metres long)	3,867	10.59	0.44	2.21

It is anticipated that a fuel pipeline to the proposed airport would be completed by 2063, which would significantly reduce the number of B-double movements each day compared to similar assumptions for the Stage 1 development. This is reflected in Table 33–4.

33.3.4. Total airport traffic generation estimate

A total airport trip generation for 2063 has been calculated using the totals for passengers, employees and freight provided in the previous sections. Table 33–5 presents the results divided into representative two hour periods, with a 24 hour total.

Table 33–5 – Total modelled traffic to / from the proposed airport in 2063

	AM Peak 2 hour	Interpeak 2 hour	PM Peak 2 hour	Evening 2 hour	24 Hour
Accessing Airport					
Passengers	8,034	7,969	8,351	7,345	66,504
Airport Workers	4,141	1,499	571	2,748	17,739
Freight (TNR)	26	79	39	171	834
Total (Accessing)	**12,201**	**9,547**	**8,962**	**10,263**	**85,077**
Egressing from Airport					
Passengers	7,887	8,121	8,071	7,342	66,385
Airport Workers	0	1,237	3,094	3,240	18,072
Freight (TNR)	26	79	39	171	834
Total (Egressing)	**7,914**	**9,437**	**11,205**	**10,753**	**85,291**

Note: TNR – The Northern Road

33.3.5. Background traffic growth

As a result of existing and future planned developments in the Western Sydney region, there is expected to be considerable development growth in the coming years: Examples include:

- South West Priority Growth Area;
- Western Sydney Employment Area;
- Greater Macarthur Investigation Area;
- proposed Western Sydney Airport; and
- smaller growth centres.

In the context of these development areas, Figure 33-12 provides a summary of vehicles generated in the vicinity of the proposed airport and shows the potential growth to 2063. The data in Figure 33-12 assumes that the proposed South West Rail Link Extension from Leppington to St Marys via the airport site is operational.

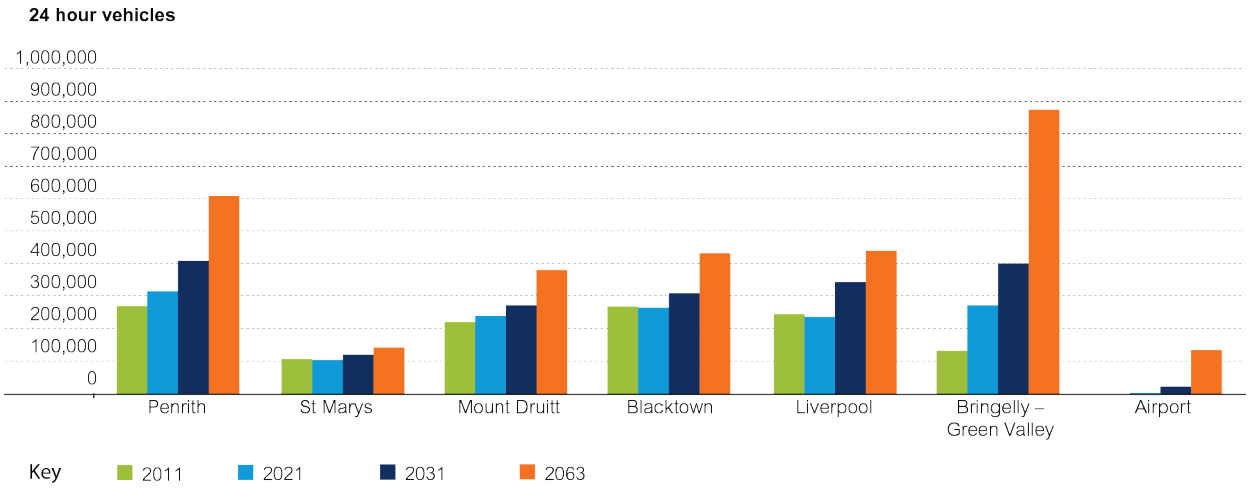


Figure 33-12 – Vehicle movements originating in the vicinity of the airport site (24 hour)

Figure 33-12 illustrates that the proposed airport represents a very small component of overall trip demand in 2031, but this would increase substantially from 2031 to an expected 130,000 trips in each direction by 2063. This would however occur in the context of much larger growth in other areas, particularly the Greater Macarthur Investigation Area (Bringelly/Green Valley).

33.3.6. Effect on network performance

As noted in Section 37.4.4, the long term operation of the proposed airport would be expected to result in 85,077 vehicles accessing the airport site each day, with 85,291 vehicles leaving the airport site.

Table 33–6, Figure 33-13 and Figure 33-14 show the 2063 network conditions for the Do Minimum and With Airport assessment scenarios, for the respective AM and PM peak periods. With or without the proposed airport, the road network is forecast be considerably congested by 2063. The assessment indicates that:

- the M4, M5 and M7 motorways have high volume/capacity ratios in both peak periods in both directions;
- Bringelly Road is congested eastbound in the AM peak and westbound in the PM peak; and
- Narellan Road is considerably more congested than in 2031.

When the expected level of traffic associated with the proposed airport is added to the network in 2063, the following additional effects would be expected:

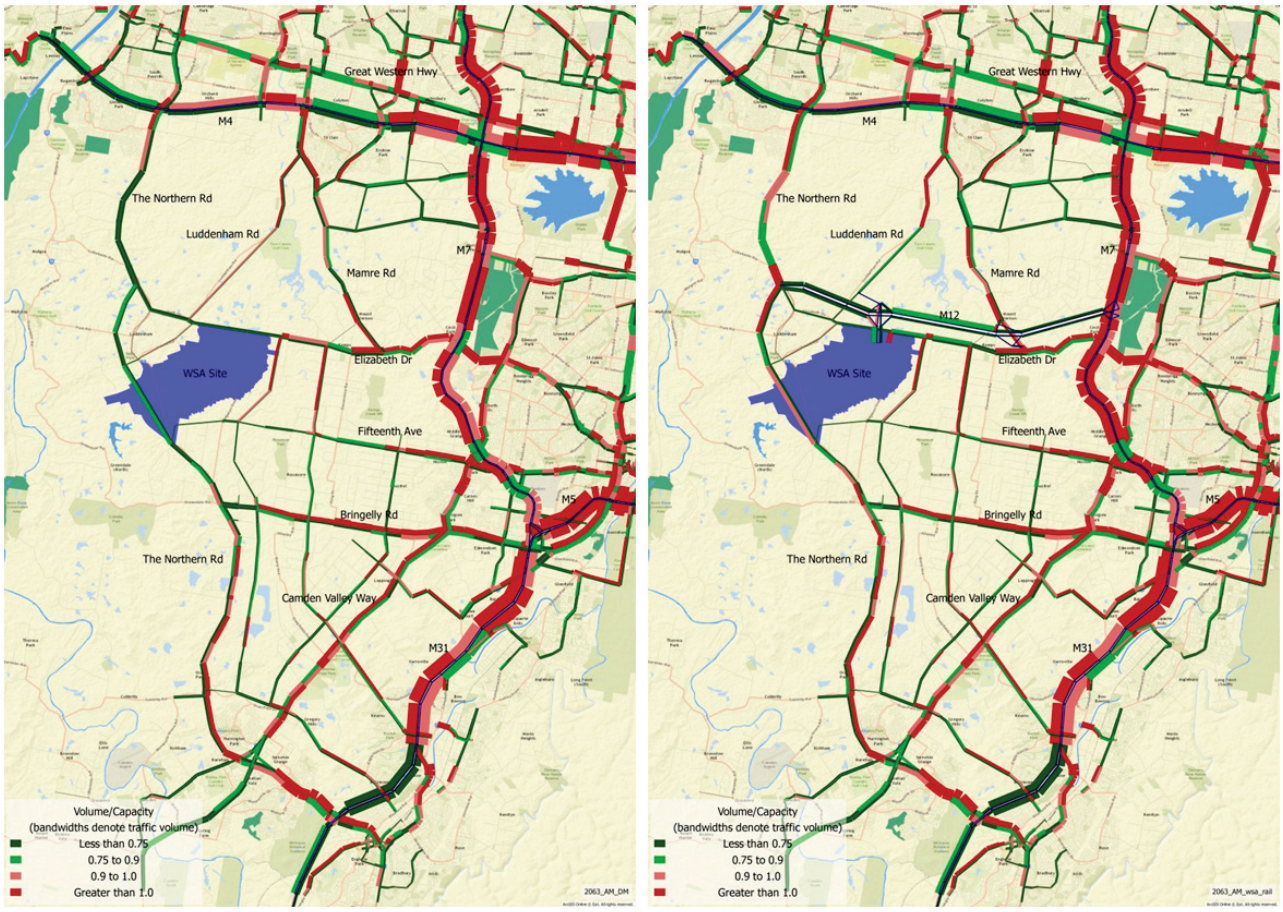
- north-south links between Elizabeth Drive and Fifteenth Avenue would be more congested with the proposed airport, rising to LoS F in both peak periods;
- The Northern Road would carry more traffic with the proposed airport and M12 Motorway in place, approximately 1000 vehicles per hour in the PM peak, north of the intersection with the M12 Motorway. By 2063, with the proposed airport, it would reach capacity;
- The M12 Motorway would form an important link to alleviate congestion on Elizabeth Drive and would continue to have spare capacity in 2063; and
- The M4 Motorway would show a lower LoS in certain sections as a result of diversion to the M12 Motorway.

Table 33–6 – Level of Service for 2063 With and Without Western Sydney Airport

Id	Road	Location	Do Minimum				With Airport			
			AM Peak		PM Peak		AM Peak		PM Peak	
			Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd
1	The Northern Road	North of Elizabeth Drive	C	C	C	C	F	F	E	E
2	The Northern Road	South of M4	F	D	D	F	F	D	F	F
3	The Northern Road	South of Bringelly Road	D	C	C	F	E	D	D	F
4	M4	West of Mamre Road	F	E	E	F	F	D	E	F
5	M4	West of M7	F	E	D	F	F	E	D	F
6	M7	South of M4	F	F	F	F	F	F	F	F
7	M7	South of Elizabeth Drive	F	E	D	F	F	F	E	F
8	M5	East of M7	F	F	F	F	F	F	F	F
9	M31	South of Campbelltown Road	F	F	F	F	F	F	F	F
10	Narellen Road	North of Tramway Drive	F	F	F	E	F	F	F	E
11	Bringelly Road	West of Cowpasture Road	F	D	D	F	F	D	D	F
12	Cowpasture Road	At M7	F	F	E	F	F	F	E	F
13	Elizabeth Drive	East of M7	F	F	E	E	F	F	F	F
14	Elizabeth Drive	West of M7	F	E	D	F	F	D	D	D
15	Elizabeth Drive	West of Mamre Road	F	C	C	F	F	C	C	E
16	Elizabeth Drive	East of the Northern Road	C	A	A	C	B	A	A	A
17	Mamre Road	North of Elizabeth Drive	F	C	C	F	F	F	D	F
18	Mamre Road	South of M4	F	F	F	E	F	F	F	E
19	Luddenham Drive	West of Mamre Road	F	C	C	F	F	F	D	F
20	Lawson Road	South of Elizabeth Drive	F	A	B	F	F	C	C	F
21	Western Road	South of Elizabeth Drive	F	B	C	F	F	C	C	F
22	Fifteenth Avenue	West of Cowpasture Road	F	B	B	E	F	B	B	E
23	M12	West of M7	-	-	-	-	B	A	A	C

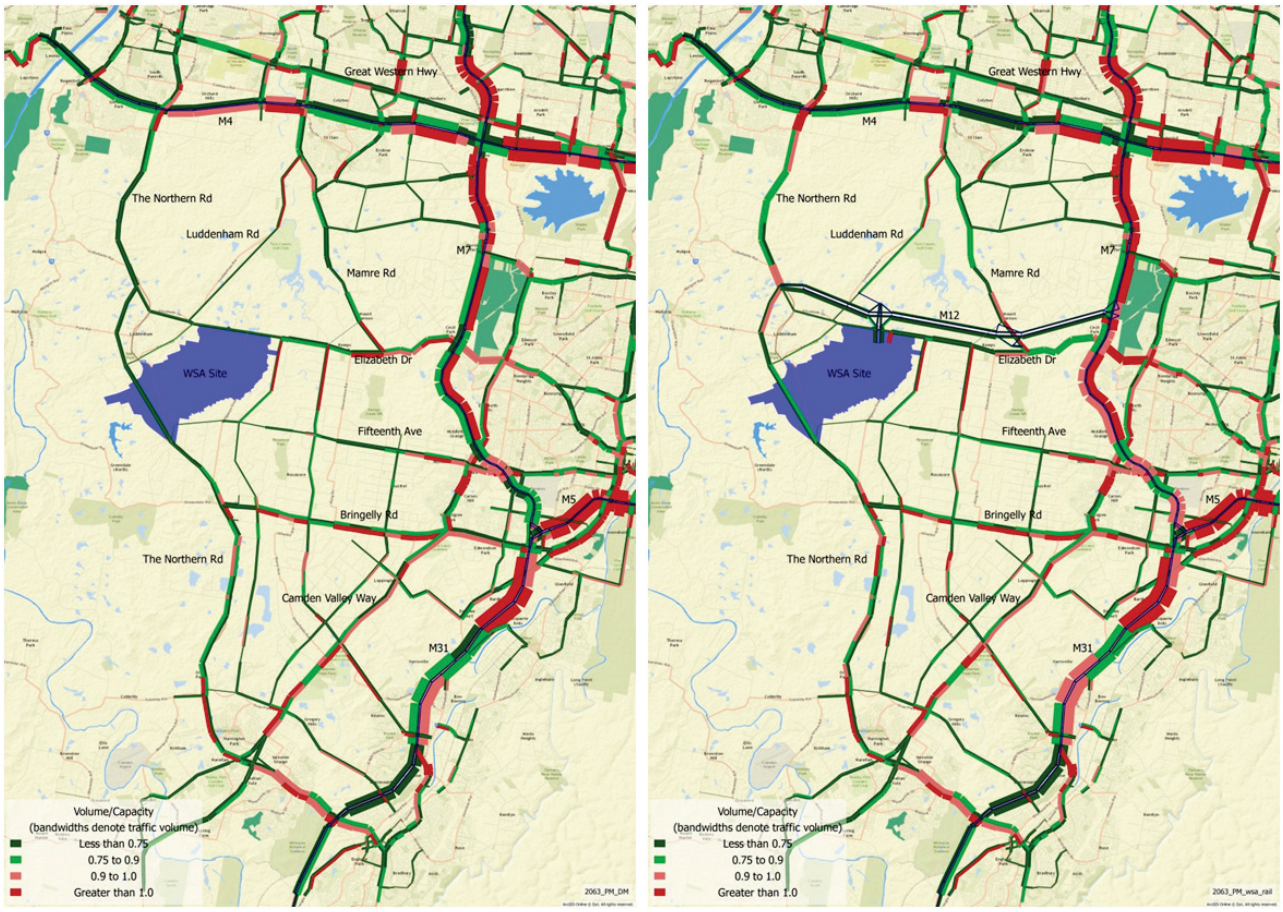
Id	Road	Location	Do Minimum				With Airport			
			AM Peak		PM Peak		AM Peak		PM Peak	
			Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd
24	M12	West of Mamre Road	-	-	-	-	D	A	A	C
25	M12	East of The Northern Road	-	-	-	-	C	C	A	C

Note: Improvements are indicated in **green bold**. Deteriorations are indicated in **red bold**.



Note: Volume/capacity ratio bandwidth definitions are outlined in Table 33–1

Figure 33-13 – 2063 AM Peak Volume/Capacity – Do Minimum (Left), with Proposed Airport (Right)



Note: Volume/capacity ratio bandwidth definitions are outlined in Table 33–1

Figure 33-14 – 2063 PM Peak Volume/Capacity – Do Minimum (Left), with Proposed Airport (Right)

33.4. Considerations for future development stages

Table 15-9 in Chapter 15 (Volume 2) sets out the broad mitigation/management measures that are proposed to address the potential transport impacts associated with construction and operation of the Stage 1 development. These measures would also generally apply to the progressive development of the long term development.

The trips that would be generated by the operation of the initial operation of the proposed airport would be largely addressed by the substantial package of road improvements proposed as part of the Western Sydney Infrastructure Plan, in addition to those identified in the Western Sydney Employment Area and the South West Priority Growth Area.

In the long term, additional transport infrastructure, including the South West Rail Link extension, would be needed to address projected travel demand associated with the proposed airport and surrounding urban development. Integral to achieving this will be detailed and early planning to preserve necessary corridors and identify the necessary infrastructure upgrades to cater for the expected population and development growth associated with the proposed airport and related development.

33.5. Summary of findings

The proposed operation of the long term development is expected to result in 85,077 vehicles accessing the airport site each day, with 85,291 leaving the airport site. These additional trips would be generated in the context of substantial urban growth in Western Sydney, particularly the development of the Greater Macarthur Investigation Area.

Travel demand generated by the proposed airport and the substantial forecast development growth in Western Sydney would have a significant combined effect on the road and public transport systems. Additional transport infrastructure, including the South West Rail Link extension, would be needed to address projected travel demand.

Long term operation of the proposed airport would be reliant on the introduction of the South West Rail Link extension after 2031. Even with the South West Rail Link extension in operation, the assessed increases in demand for 2063 show that detailed planning would be required to preserve additional corridors and transport upgrades to cater for the population and development growth associated with the proposed airport and surrounding urban development.